(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 913 895 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
06.05.1999 Bulletin 1999/18

(51) Int Cl.[6]: H01R 43/01

(21) Application number: 98307311.5

(22) Date of filing: 10.09.1998

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: 30.10.1997 JP 316269/97

(71) Applicant: NICHIFU TERMINAL MANUFACTURE CO., Ltd.
Tsurumiku, Osaka (JP)

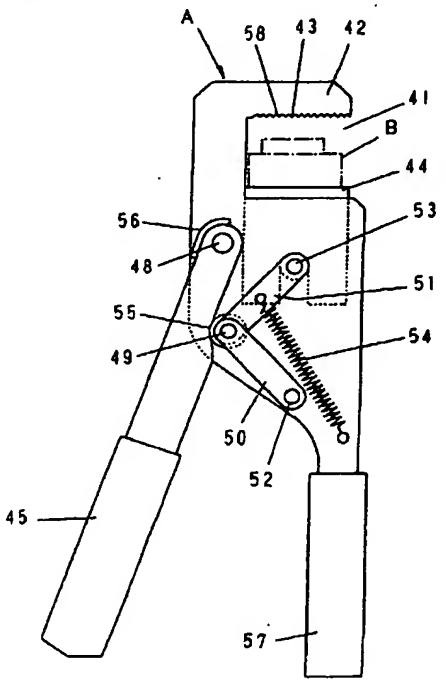
(72) Inventors:
- Mori, Katsuhisa
  Kita-ku, Osaka (JP)
- Yamagata, Kyuzo
  Ngaokakyo-shi, Kyoto (JP)
- Kagita, Tsuyoshi
  Osaka (JP)

(74) Representative: Hillier, Peter et al
Reginald W. Barker & Co.,
Chancery House,
53-64, Chancery Lane
London, WC2A 1QU (GB)

(54) Portable press for insulation displacement connectors

(57) A portable press (A) for insulation displacement connectors (B) has a main body (42) and a plunger (44) driven by a pivoted rockable lever (45) towards and away from the body. The plunger has a support face confronting the body's stationary plane (43) to define a cavity (41) having an inner wall and receiving the connector together with contacts. A portion of a VVF cable (3) held in a recess (46) formed in the body protrudes into the cavity to be cut off by a knife (47) of the plunger, so that the internal jacket (32) covering one conductor (33) is exposed in part. The stationary plane and/or support face have a rugged pattern (58) to carve a marking on the contacts (1) forced into the connector by the portable press.

FIG. 1



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Description

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The present invention relates to a portable press for use to electrically connect two or more cables to each other in a branching connector of the so-called insulation displacement type. Each cable consists of two or three conductors, respectively called 'two-wire cable' or 'three-wire' cable. They are either bare or tightly covered with discrete internal insulating jackets and a common external insulating mantle. This mantle also tightly covers the bare conductors or the internal jackets. Both the internal jackets and the external mantle are formed of the same or different polyvinyl chloride resins (symbolized as 'PVC-PVC' and abbreviated to 'VV') or the like. Those two or three conductors are arranged side by side to render the cable flat (abbreviated to 'F'). Therefore, the cables of this kind will be referred to herein as 'VVF', as usually being called so in this field.

Prior Art

[0002] It has been a common and widely employed practice to form a branch line by connecting one such VVF cable to another existing or bus cable. Since the conductors are usually covered with insulating jackets, they have been be distinguished one from another relying on their colors to supply any apparatus or equipment receive with electric power of correct polarity through the branch line Thus, two colors such as 'white' and 'black' contrasting one with another are applied to two internal jackets in each two-wire VVF cable. Similarly, three colors such as 'white', 'black' and 'red' also in good contrast with each other are applied to three internal jackets in each three-wire VVF cable. When diverging a branch from a bus or main cable, every two conductors that are of the same color and included in the branch and the main will be connected one to another.

[0003] If such a bus or main cable is a live existing wire, then this cable has to be switched off at first to avoid electric shock. Fig. 22 shows a subsequent branching operation, in which the bus or main cable 3 for instance a two-wire VVF cable will be severed to provide two cable ends at any desired location. The external mantle 31 is then removed from each cable end so that a positive and negative conductors enclosed with internal jackets have their end portions exposed. Subsequently, each conductor end 33a itself will in turn be exposed by removing a proper length of its jacket 32a and 32b. Likewise, an end of the branch VVF cable 3' will be treated with to remove proper lengths of its external mantle 31 and internal jackets 32a and 32b also from the positive and negative conductors so that end portions thereof are exposed. Next, the positive conductor ends 33a of the main and branch cables are placed together into a metal sleeve 6, which is embedded in an insulating cap 61 having a closed end. By using a crimper to depress the metal sleeve through the insulating cap, those juxtaposed ends of positive conductors are electrically united, with negative ones being also treated with in the same manner.

[0004] In the prior art method as summarized above, the live bus or main cable from which a branch has to be diverged must be turned off prior to the branching operation, thereby causing a considerably long period of power cut for safety of the operator performing very cumbersome and inefficient works.

[0005] In view of those drawbacks, the present applicant has already proposed an advanced connector with which the branching operation can be finished safely, rapidly and without previously removing the insulating jackets and mantle from VVF cables involved. The present invention intends to further improve the branching technology, and a primary object is to provide a simple and portable press consisting of a pressing mechanism and an external mantle-severing mechanism. The pressing mechanism may be such that metal contacts accompanying a connector be forced into the connector's body. The external mantle-severing mechanism may be such that each VVF cable has an end stripped of its external mantle to an extent enough to determine the color of at least one internal jacket to know polarity of the conductor embedded therein.

[0006] Due to the recent intensive social requirement of "product liability" (PL), it is now necessitated frequently to see where the responsibility had lain for any unforeseen various accidents. However, it has been difficult for the branching operators performing the prior art method to automatically record their names on the connectors or to leave on their tools any traces or marks indicating their works done, thus disabling it to determine what or who was wrong.

[0007] Another object of the present invention is therefore to provide a portable press of such a structure that an appropriate marking will automatically be carved in the surface of a connector to record the fact that a correct tool was used adequately in a right order.

SUMMARY OF THE INVENTION

[0008] From a first aspect, a portable press for the insulation displacement connectors provided herein comprises in principle a main body, a movable plunger, the main body having a stand with a stationary plane, a rockable lever pivoted to the main body so as to drive the movable plunger to reciprocate towards and away from the stationary plane of the stand, the movable plunger having an upper support face confronting the stationary plane, a cavity defined between the stand serving as one of a pair of jaws and the movable plunger serving as the other jaw, and the cavity being expansible and contractible to receive therein the connector together with contacts having to be forced therein. At least one

of the stationary plane and the support face has a rugged pattern formed therein to carve a marking in at least one of each contact and a bottom face of the connector, the marking indicating that the contacts have been pressed with the portable press.

[0009] Preferably the rugged pattern for the carved marking is formed in the stationary plane, though it may be formed in both this plane and the upper support face of the plunger.

[0010] From a second aspect, a portable press provided herein for insulation displacement connectors does comprise in principle a main body, a movable plunger, the main body having a stand with a stationary plane, a rockable lever pivoted to the main body so as to drive the movable plunger to reciprocate towards and away from the stationary plane of the stand, the movable plunger having a support face confronting the stationary plane, a cavity having an inner wall and defined between the stand serving as one of a pair of jaws and the movable plunger serving as the other jaw, the cavity being expansible and contractible to receive therein the connector and together with contacts having to be forced therein, the plunger being driven to move along the inner wall of the cavity. These members and parts are the same as those involved in the crimper provided from the first aspect, but the press provided from the second aspect does further comprise an additional feature that a recess for temporarily holding a VVF cable is formed in the main body and a knife is fixed to the movable plunger so as to reciprocate in unison therewith and along the inner wall of the cavity. The recess has a mouth in flush with the inner wall of the cavity such that the VVF cable held therein may have one side protruding into the cavity over the mouth so that the knife cuts off a portion of an external insulating mantle covering the cable to such an extent that an internal jacket covering one conductor extending through the cable is exposed in part.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011]

Fig. 1 is a side elevation of a portable press provided in a first embodiment and having a movable plunger and a rockable lever;

Fig. 2 is a side elevation corresponding to Fig. 1 but showing the movable plunger forced up using the rockable lever;

Fig. 3 is a perspective view of the press' portion where a cavity is formed between a pair of jaw-like members, wherein one of them having a rugged pattern;

Fig. 4 is a cross section of the press' portion in Fig. 3 but shown on an enlarged scale;

Fig. 5 is a cross section corresponding to Fig. 4, with the other member also having the rugged pattern;

Fig. 6 is a perspective view of a modification of the rugged pattern;

Fig. 7 is a side elevation of a portable press provided in a second embodiment and having a movable plunger, a rockable lever and a recess formed beside the plunger;

Fig. 8 is a side elevation corresponding to Fig. 7 but showing the movable plunger forced up using the rockable lever;

Fig. 9 is a perspective view of some members and parts shown in Fig. 8 and ready for the step of partially severing the external insulating mantle of a two-wire VVF cable held in and through the recess;

Fig. 10 is a cross section of the members shown in Fig. 9 and shown in their state after the severing step;

Fig. 11 is a perspective view of the VVF cable whose external insulating mantle is severed off in part;

Fig. 12 is a cross section corresponding to Fig. 10, but a three-wire VVF cable having its external insulating mantle partially severed off;

Fig. 13 is a perspective view corresponding to Fig. 9, but showing a modified example;

Fig. 14 is a perspective view of a connector comprising an upper half and a lower half and shown in its opened state wherein contacts have not been placed yet through the upper half;

Fig. 15 corresponds to Fig. 14, but one cable's body as a bus as well as another cable's end as a branch having been placed in the lower half of the connector;

Fig. 16 is a perspective view showing the connector whose upper half have been folded onto the lower half to grip therebetween the cables, with the contacts having been set in slots formed in the upper half;

Fig. 17 corresponds to Fig. 16, but the contacts being currently forced into the connector;

Fig. 18 in turn corresponds to Fig. 17, but the contacts having already been forced into the connector;

Fig. 19 is a perspective view of the connector and the cables crimped therein, with the contacts having been hidden with a closed lid of said connector;

Fig. 20 is a cross section corresponding to Fig. 19;

Fig. 21 is a perspective view also corresponding to Fig. 19, but some portions of the parts and members being cut off for the purpose of clear visual presentation; and

Fig. 22 is a perspective view of a VVF bus cable with a VVF branch cable being crimped together by the prior art method.

THE PREFERRED EMBODIMENTS

[0012] Figs. 1 to 4 show a portable press provided herein in accordance with a first embodiment. This press 'A' comprises a main body 42 and a movable plunger 44, wherein the body has as one of its portions a stand defining a jaw-shaped region 41 and having a stationary plane 43. This plane supports a connector 'B' in which

contacts have to be fixed on cables. The plunger 44 having an upper support face is driven to reciprocate towards and away from the stationary plane. Both the support face and the stationary plane 43 are flat and lie in parallel with each other. With the plunger 44 being retracted to its home position most remote from the plane 43, the connector 'B' can easily be interposed between this plane and the plunger's upper face.

[0013] Either or both of the stationary plane 43 and the upper support face of the plunger 44 has formed therein a rugged pattern 58. This pattern will serve to leave on the contact 'B' intrinsic traces indicating information or details concerning a pressing operation that has been done. In an example illustrated in Figs. 1 - 4, only the stationary plane 43 has such a rugged pattern consisting of parallel ridges each being triangular in cross section. Alternatively, both the plane 43 and the upper face of plunger 44 may have such patterns as shown in Fig. 5. Those triangular ridges may skew relative to the plane or face in a manner shown in Fig. 6, and may be replaced with a plurality of circular or triangular cones.

[0014] The plunger 44 will be driven up and down by forcibly rocking a rockable lever 45 that is operatively connected by pivot 48 to the main body 42. In the present embodiment, two arms 50 and 51 have their one ends pivoted one to another by a pin 49 so as to assume an L-shape. One of those arms 50 has the other end pivoted by a further pin 52 to the main body 42, whilst the other arm 51 has the other end pivoted by a still further pin 53 to a rear end of the plunger 44. A coiled spring 54 always urges the pivot 49 outwards through one arm such that those arms 50 and 51 tend to assume a sharper L-shape. A cam roller 55 mounted on and coaxially with the pivot 49 is thus always urged towards and onto the basal portion's inner face of the rockable lever 45. The reference numeral 56 denotes a stopper inhibiting this lever from swinging outwards beyond an outer limit. When the rockable lever 45 at a home position shown in Fig. 1 is pulled towards a stationary lever 57, the press will take its position shown in Fig. 2 wherein the cam roller 55 shifts inwards stretching the arms 50 and 51 and driving the plunger upwards.

[0015] The drive mechanism for the plunger 44 may be modified for example by disposing at the distal end of the rockable lever 45 a cam or gear rotatable to reciprocate the plunger.

[0016] Figs. 7 to 10 show a second embodiment which, in addition to the features of the first embodiment, comprises a recess 46 for holding a VVF cable 3. This recess has a mouth in flush with the inner wall of the jaw-shaped cavity 41 in which the plunger 44 reciprocates. An adjusting screw 59 controls the position of the cable fitting in the recess 46. Further, a knife 47 fixed to the plunger 44 will move in unison therewith to sever and remove a portion of the external insulating mantle 31. Thus, a portion of the internal one 32 of one conductor 33 will be exposed by the knife. Since the adjusting screw 59 screwed in the main body 42 has an end that protrudes any selected distance into the recess 146 within which the knife 47 reciprocates.

[0017] Fig. 9 illustrates an example wherein a two-wire cable 3 extends through the recess 46 and the screw 59 has been manipulated letting the cable have one of its lateral sides jutting a proper distance out of the recess 46. Subsequently the lever 45 will be driven to raise the plunger 44 so that the knife 47 severs and removes a limited portion of the external mantle 31. As will be seen in Figs. 10 and 11, the internal jacket 32 of one of the two conductors 33 will thus be exposed, its color enabling it to identify the polarity of those conductors to be pressed in and connected to a connector 'B' detailed below.

[0018] Fig. 12 illustrates another example wherein a three-wire cable 3 is disposed by the adjusting screw 59 also at its appropriate transverse position. Its external mantle 31 has just been cut off in part to expose the internal jacket 32 of one of the three conductors 33.

[0019] Fig. 13 shows a modification of the press provided in the second embodiment. In this case, the rugged pattern 58 is dispensed with.

[0020] Figs. 14 to 21 show an example of the connector 'B' to be used together with contacts 1 in the works using the press provided herein. Those contacts 1 adapted to two-wire cables and each of a generally inverted-U shape in side elevation are made by pressing a conductive brass plate much harder than the cables 3 or 3'. Each of the contacts 1 consists of two parallel flat pieces and has two slits 11 and 11 that are separated and spaced by a mediate indentation a proper distance from each other. Each slit 11 formed in the contact is of such a configuration that one of the conductors 33 covered with the jackets 32 and mantle 31 comes into a close and electric contact with the slit.

[0021] In detail, two side cutters that are disposed beside and adjacent to the respective slits 11 do pierce each cable in the middle of its width 'W -capital' (with 'w -minuscule' denoting thickness). Each side cutter extends in a direction from one of the flat pieces constituting each contact to the other flat piece. A portion located right beneath each slit 11 is formed to be a pair of V-shaped blades for making the slit sever the jackets 32 and thus causing the slit to bite and strongly clip the conductor 33 shielded in said jacket 32. A plastics tablet is bonded to the outer face of a bridge uniting the flat pieces in each contact.

[0022] On the other hand, a body 2 of the connector 'B' is an integral piece of a plastics such as a Nylon (registered trademark), a polyethylene, a polypropylene or the like. The body 2 having a lid 26 consists a pair of constituent halves 2a and 2b substantially of the same shape. Formed in each half are two parallel grooves 21 and 22 for receiving the bus and branch two-wire cables 3 and 3', respectively. Further formed in one of those halves 2a are two slots 23 through which the contacts 1 will be forced into the connector. A foldable common

ear 24 is folded integral with one sides of the halves 2a and 2b, whose other sides respectively have a perforated principal ear 20a protruding sideways and a lug 20b fittable therein.

[0023] The lid 26 is connected by flexible bands 25 to one of the connector body's halves 2a. Hooks 27 of the lid 26, that extends outwardly of this half 2a in a direction parallel with the grooves so as to overlap the other half 2b, are engageable with additional perforated ears 27a formed beside the principal ear 20a. Eye-tabs 35 protruding from the other half 2b will be used to suspend this connector from any neighboring article.

[0024] The width of each split groove 21 and 22 is substantially equal to the width 'W(capital)' in a plane in which the conductors are arranged side by side in each of the cables. The sum of depth of mating split grooves 21 and 21, or 22 and 22 is substantially the same as the thickness 'w(minuscule)' of each cable. Therefore, those cables will closely fit in the respective completed grooves. The distance between the longitudinal axes of the two complete grooves 21 and 22 corresponds to that between the slits 11. The shape and size of each slot 23 are such that the lower part of one contact 1 can remain therein as shown in Fig. 16, unless and until any intentional or unintentional external force is applied thereto.

[0025] A blind plate 28 is fixed to one longitudinal end of the one groove 22, because it is intended in this embodiment to diverge only one branch VVF cable 3' from the live bus line 3. After placing the bus cable 3 in the other groove 21, the branch cable may be inserted in the one groove 22 until its cut end collides with the blind plate 28 to be located in parallel with said bus cable.

[0026] In operation for taking a branch from any existing VVF cable (i.e., referred to above as the bus cable) with use of the connector described above, the existing two-wire cable 3 whose insulating jackets and mantle have not yet been stripped at all from its conductors will be placed at first in the split groove 21 of either half 2a or 2b ('2b' in this example) of the connector body, as shown in Fig. 15. Then, a new length of two-wire VVF cable will be placed in the other split groove 22 while checking its cut end to ensure that its conductors be positioned correctly with respect to their polarity as compared with that of the existing cable. After pushing the new cable along the groove until its cut end abuts against the blind plate 28, the other half ('2a' in this case) of the connector body will be over-laid on the one half ('2b') by flexing the foldable common ear 24, as seen in Fig. 16. The perforated ear 20a thus engage with the lug 20b, since they are located at that time at the same side opposite to the common ear. It may be possible in an alternative manner of operation to insert the end of a new cable into the connector whose half bodies have been closed with each other.

[0027] Fig. 17 illustrates the next step at which the contacts 1 are pressed with the press 'A' one by one deep into the slots 23 until thoroughly hidden therein as shown in Fig. 18. As a result, the rugged pattern on the stationary plane 43 will produce a marking 15 on the outer face of the bridge uniting the flat pieces in each contact. If the press which Fig. 5 illustrates is used, then such a marking or traces will also appear on the bottom of the connector's bottom face.

[0028] Finally, the lid 26 will be folded back by bending the flexible bands 25, so that the four hooks 27 at the four corners of the lid thus covering the outer face of the connector will engage with the respective perforated ears 27a of the half 2a.

[0029] By pressing the contacts 1 in the described manner, the two pairs of the V-shaped blades of each contact will pierce both the mantle 31 and jackets 32, so that the slits 11 bite two conductors 33 of the same polarity but belonging to the different cables 3 and 3'. Those two conductors are thus electrically connected one to another as will be clearly seen in Figs. 20 and 21. Simultaneously with such an "insulation displacement contacting", the two side cutters of each contact are forced in between the two conductors covered with jackets so as to separate these jackets one from another within each cable. A branch cable can now be connected readily and easily to any existing or bus cable in the manner described hereinbefore.

[0030] The foregoing embodiments and examples may be modified in any manner along the spirit of the present invention and within the scope thereof as defined in the accompanying claims.

[0031] The portable press set forth in the claim 1 is advantageous in that any wrong or unprescribed press used to force contacts 1 into slots 23 would leave on the contact faces strange traces different from those preregistered and produced by the normal rugged pattern 58, thereby enabling it to see where the liability or responsibility of the branching operations was present and to indirectly prevent any problems or accidents resulting from imperfect or incorrect works.

[0032] Further, the feature as set forth in claim 4 has a beneficial effect that one and the same tool can be used not only to press contacts 1 through slots 23 into a connector body but also to previously remove a small portion of a VVF cable's mantle so as to check or confirm the color of one jacket indicating polarity of a conductor covered therewith. Thus, the branching operations are rendered easier, and the number and kinds of necessary tools are reduced to protect the operators from fatigue.

Claims

1. A portable press for insulation displacement connectors, the press comprising:

   a main body;
   a movable plunger;
   the main body having a stand with a stationary plane;
   a rockable lever pivoted to the main body so as

to drive the movable plunger to reciprocate towards and away from the stationary plane of the stand;
the movable plunger having an upper support face confronting the stationary plane;
a cavity defined between the stand serving as one of a pair of jaws and the movable plunger serving as the other jaw; and
the cavity being expansible and contractible to receive therein the connector together with contacts that has to be forced into the connector,
wherein at least one of the stationary plane and the support face has a rugged pattern formed therein to carve a marking in at least one of each contact and a bottom face of the connector, the marking indicating that the contacts have been pressed with the portable press.

2. A portable press as defined in claim 1, wherein the rugged pattern for carving the marking is formed in the stationary plane.

3. A portable press as defined in claim 1, wherein the rugged pattern for carving the marking is formed in both the stationary plane and the upper support face of the plunger.

4. A portable press for insulation displacement connectors, the press comprising:

a main body;
a movable plunger;
the main body having a stand with a stationary plane;
a rockable lever pivoted to the main body so as to drive the movable plunger to reciprocate towards and away from the stationary plane of the stand;
the movable plunger having a support face confronting the stationary plane;
a cavity having an inner wall and defined between the stand serving as one of a pair of jaws and the movable plunger serving as the other jaw;
the cavity being expansible and contractible to receive therein the connector together with contacts that have to be forced into the connector;
the plunger being driven to move along the inner wall of the cavity;
a recess for temporarily holding a VVF cable;
the recess being formed in the main body and having a mouth; and
a knife fixed to the movable plunger so as to reciprocate in unison therewith and along the inner wall of the cavity,
wherein the mouth is in flush with the inner wall of the cavity such that the VVF cable held therein has one side protruding into the cavity over the mouth so that the knife cuts off a portion of an external insulating mantle covering the cable to such an extent that an internal jacket covering one of conductors extending through the cable is exposed in part.

5. A portable press as defined in claim 4, wherein an adjusting screw is disposed in a region of the main body, the region defining a bottom of the recess, so that the cable temporarily held therein is controlled in position relative to the recess.

6. A portable press as defined in claim 4 or 5, wherein at least one of the stationary plane and the support face has a rugged pattern formed therein to carve a marking in at least one of each contact and a bottom face of the connector, the marking indicating that the contacts have been pressed with the portable press.

7. A portable press as defined in claim 6, wherein the rugged pattern for carving the marking is formed in the stationary plane.

8. A portable press as defined in claim 6, wherein the rugged pattern for carving the marking is formed in both the stationary plane and the upper support face of the plunger.

FIG. 1

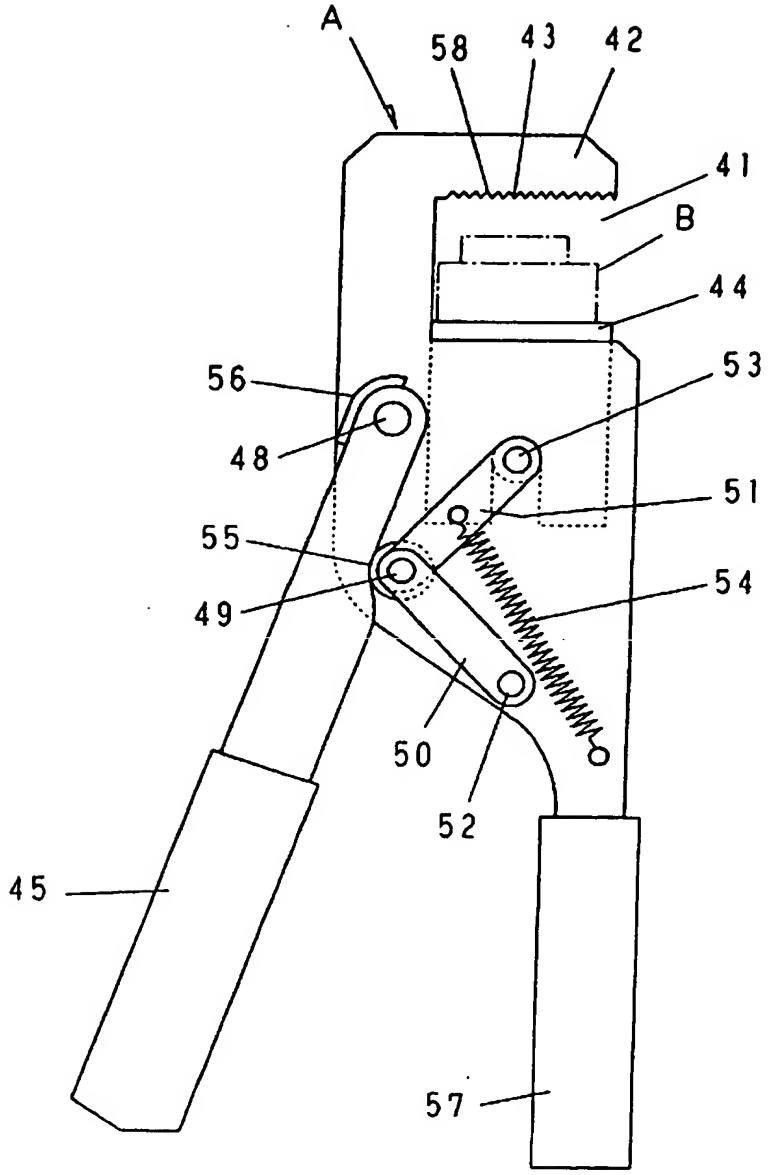

FIG. 2

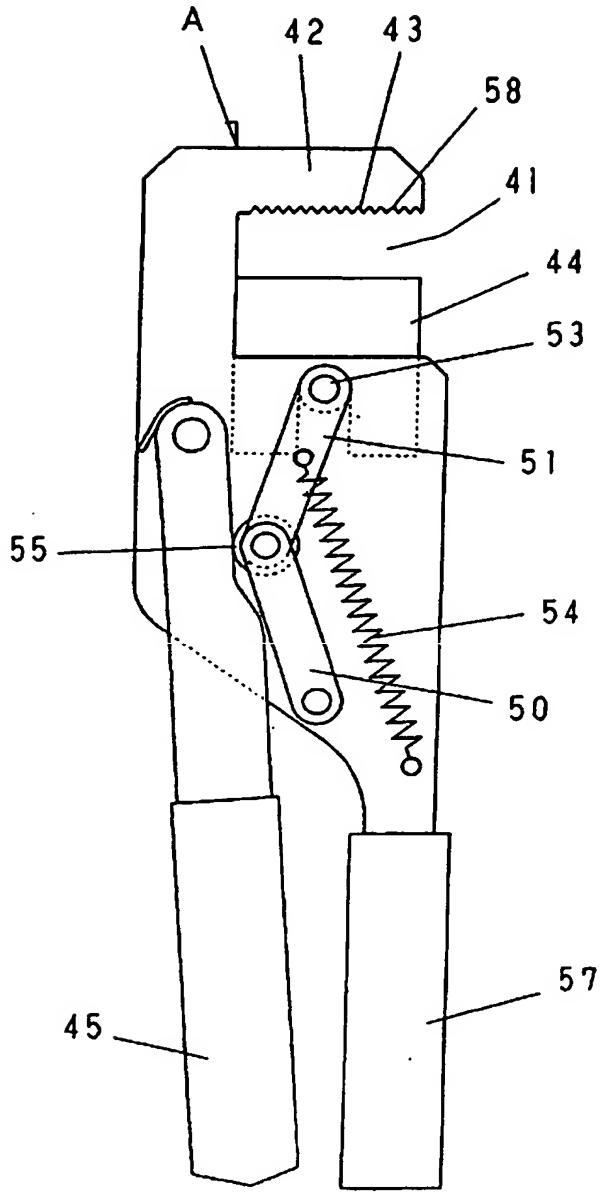

FIG. 3

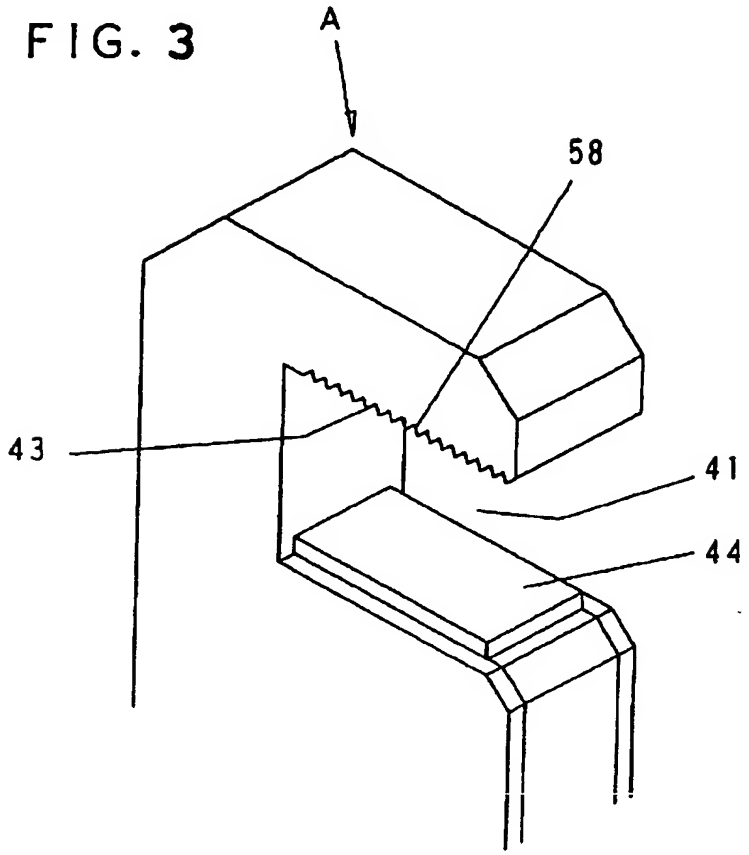

FIG. 6

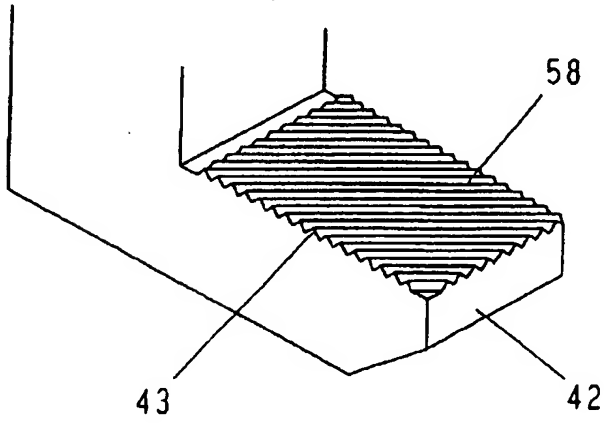

FIG. 4

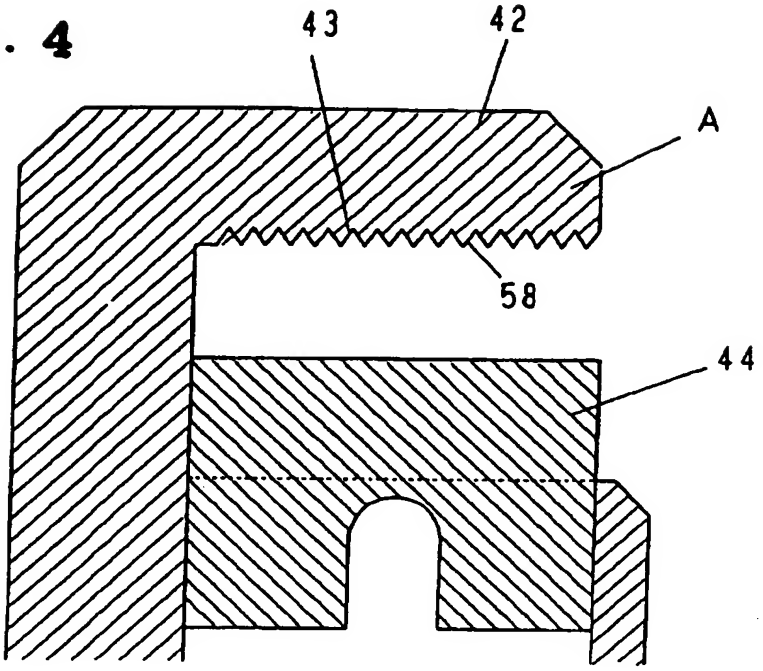

FIG. 5

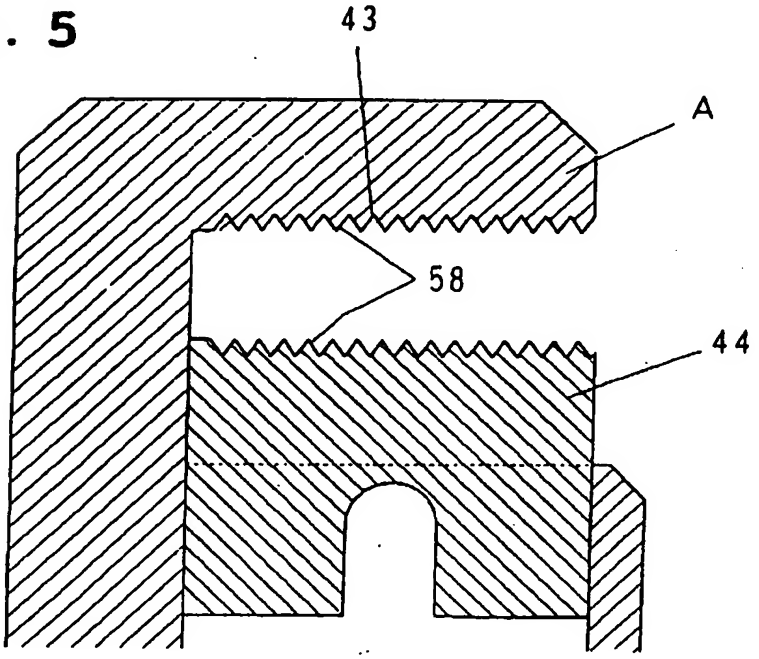

FIG. 7

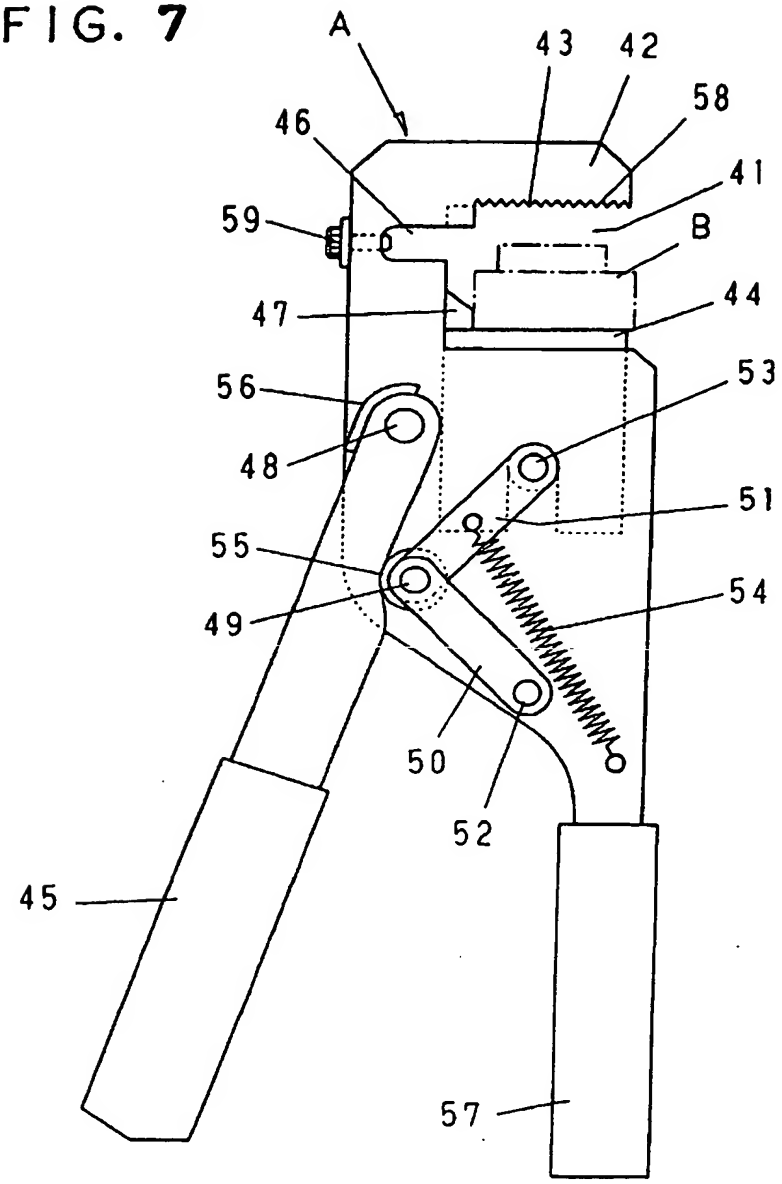

FIG. 8

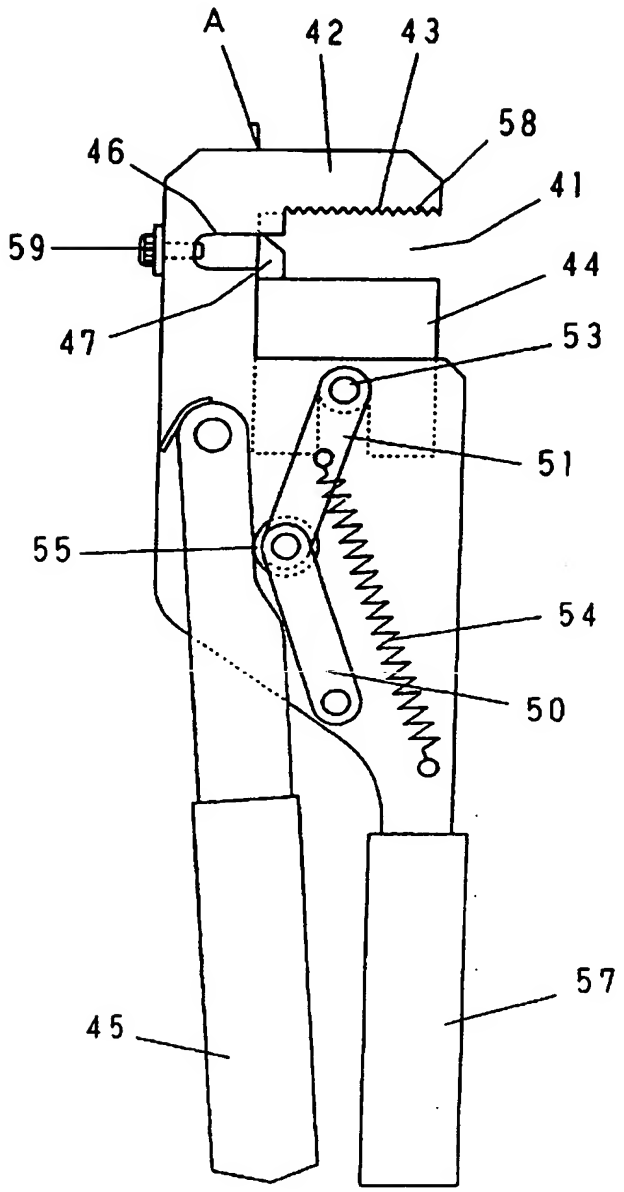

FIG. 9

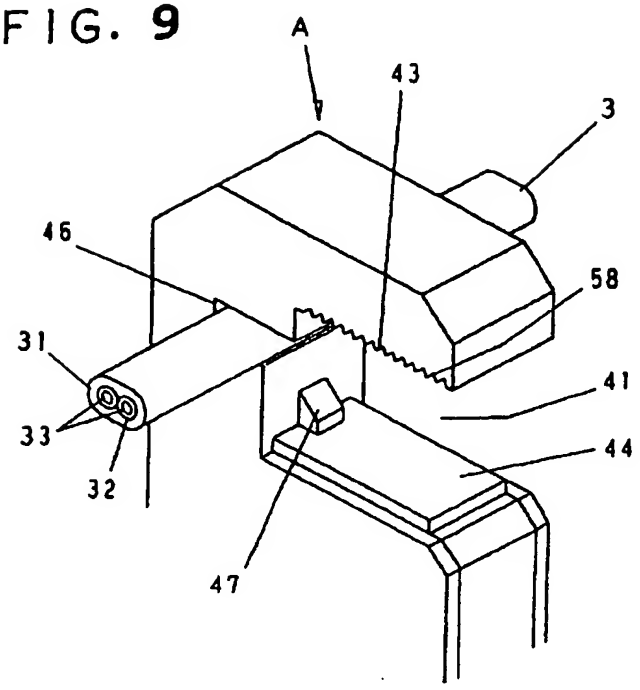

FIG. 13

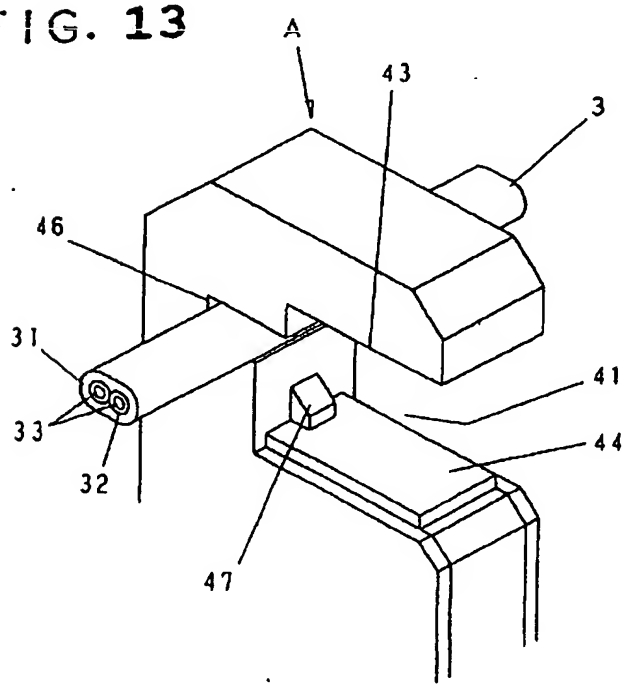

FIG. 10

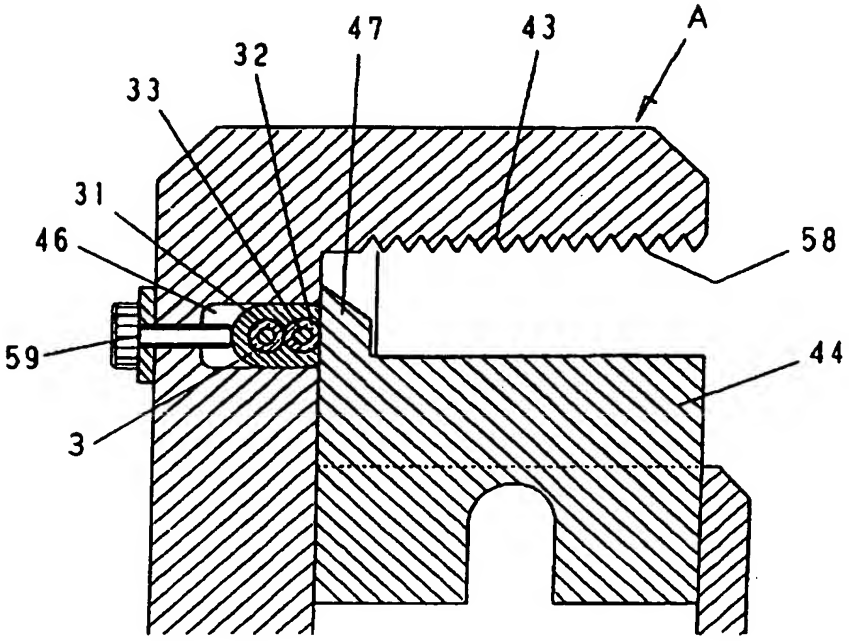

FIG. 11

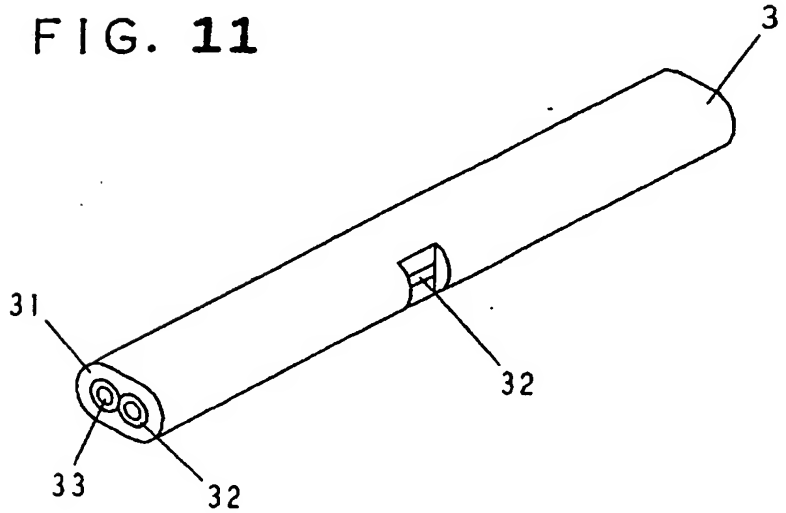

FIG. 12

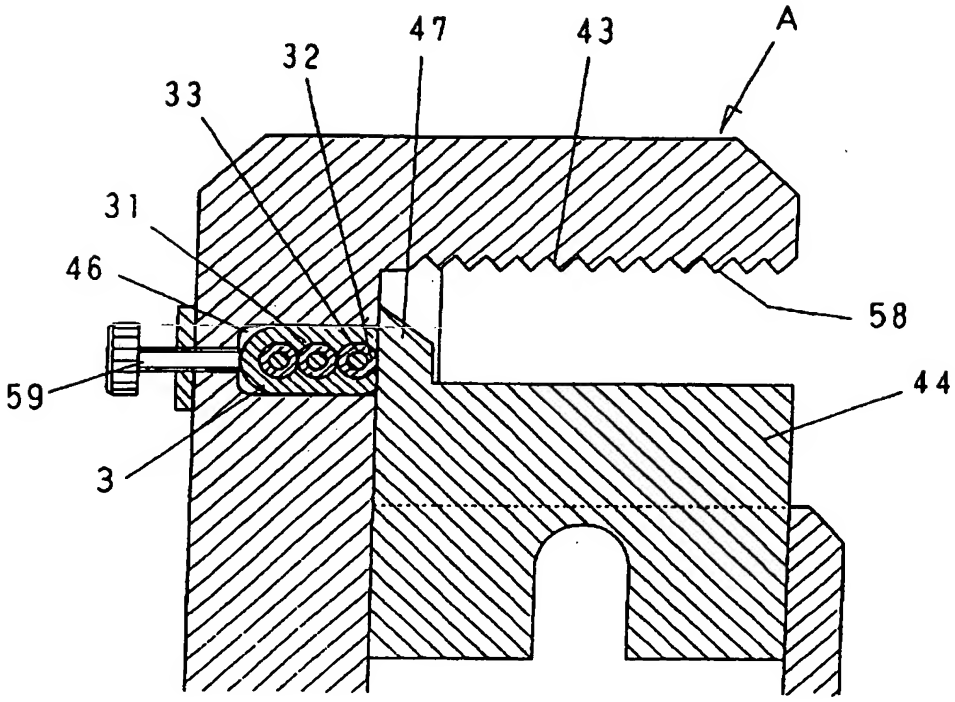

FIG. 14

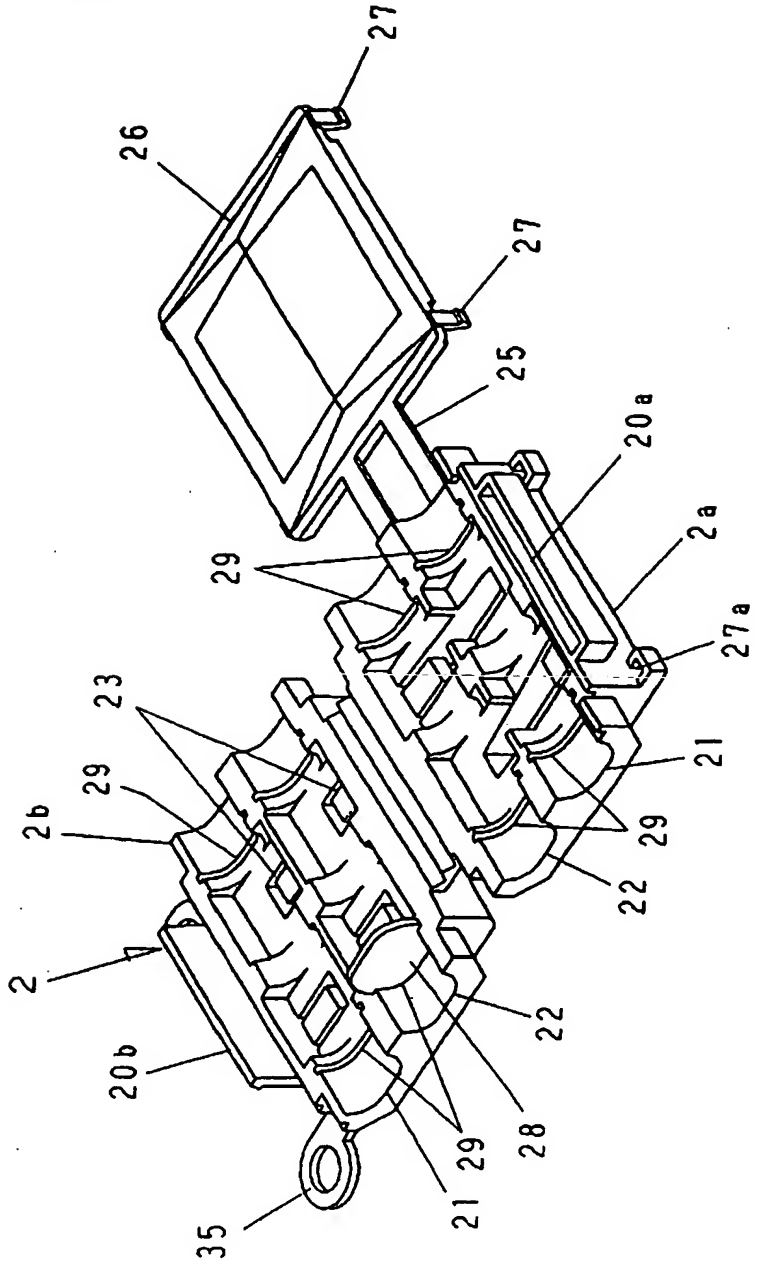

FIG. 15

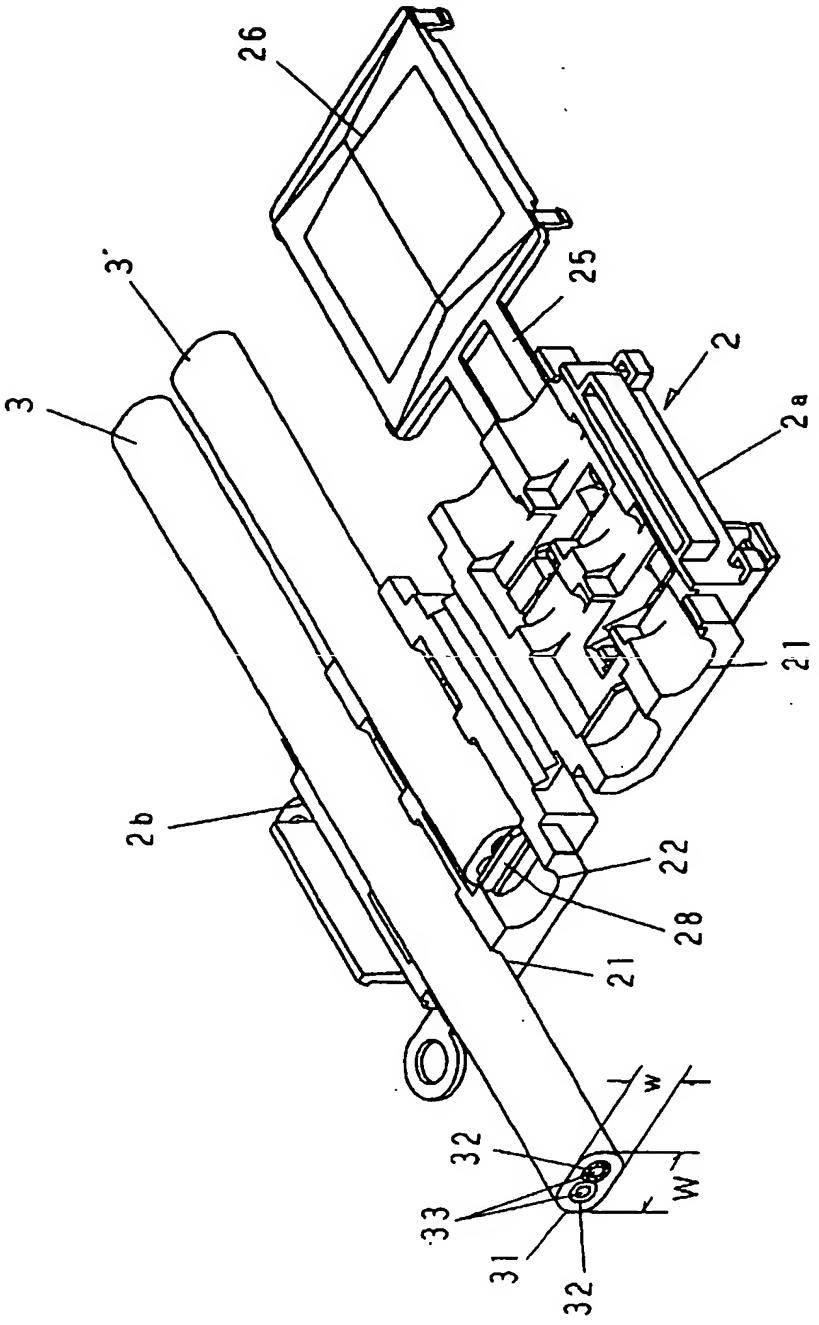

FIG. 16

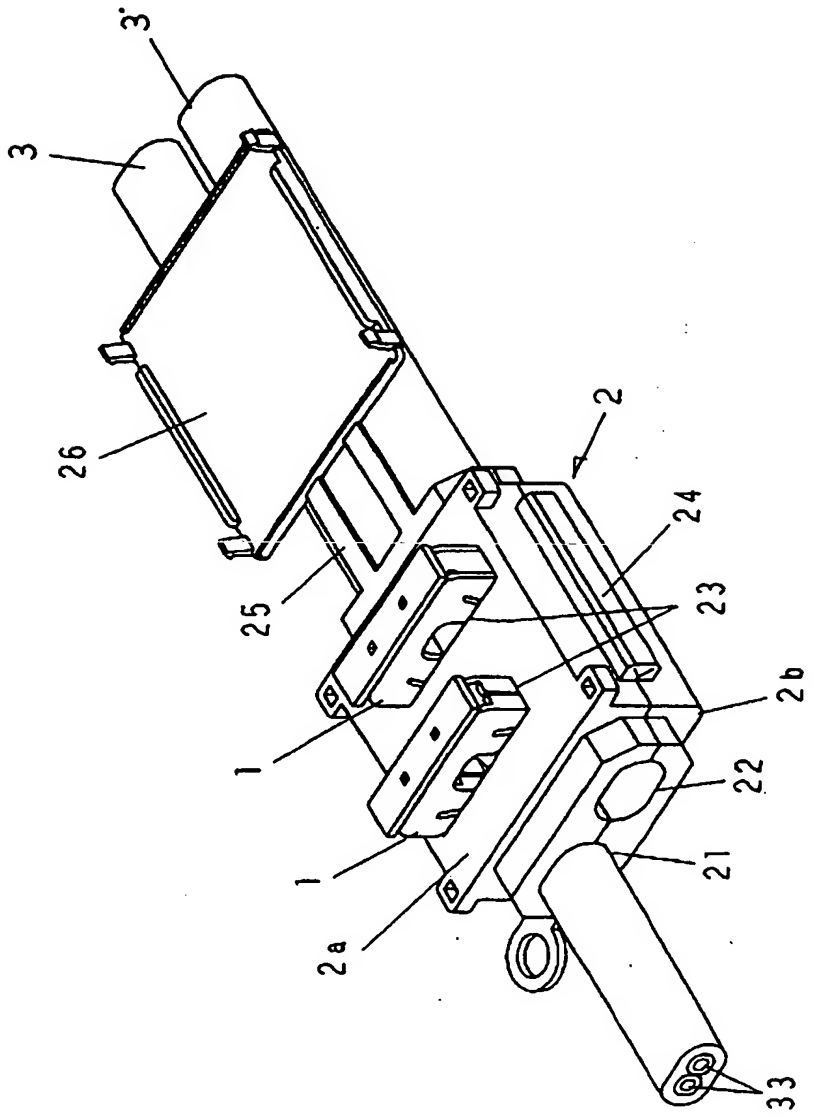

FIG. 17

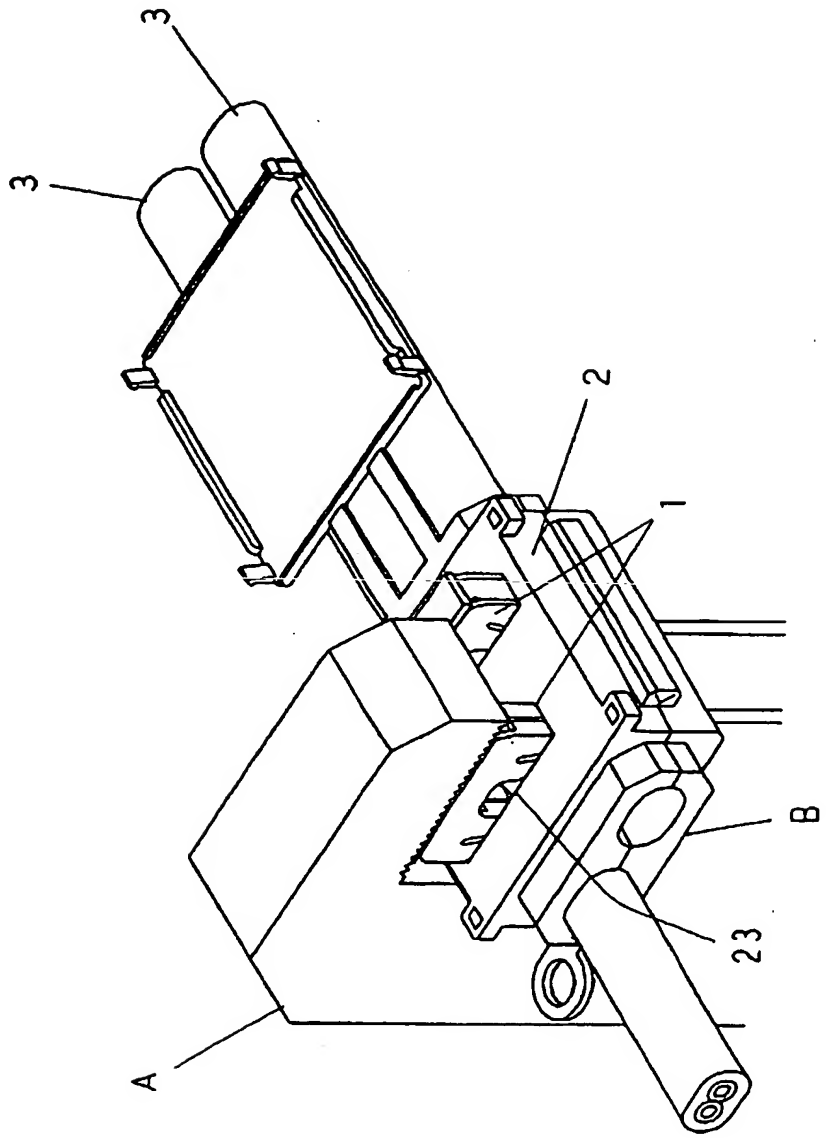

FIG. 18

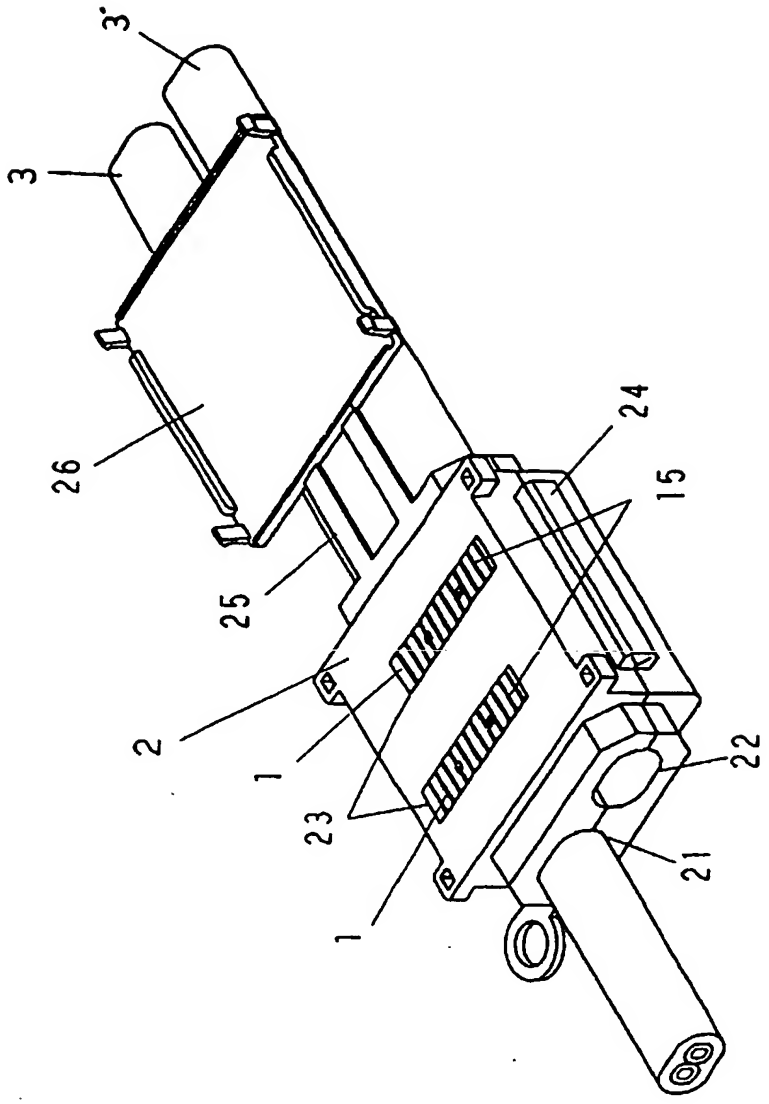

FIG. 19

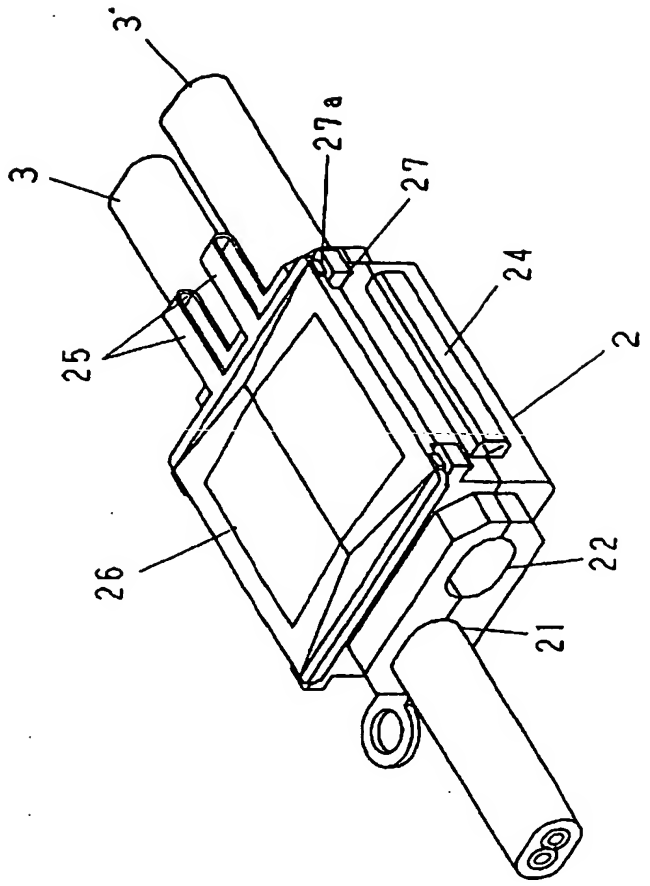

FIG. 20

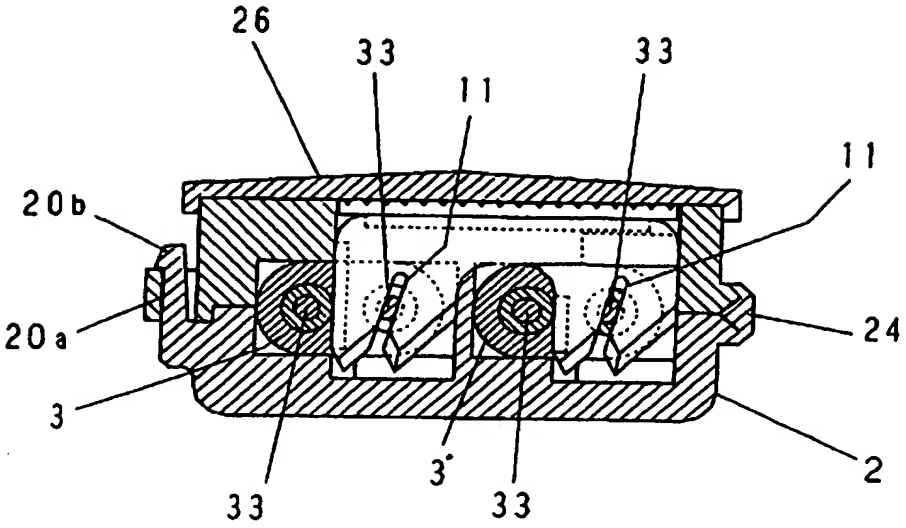

FIG. 22

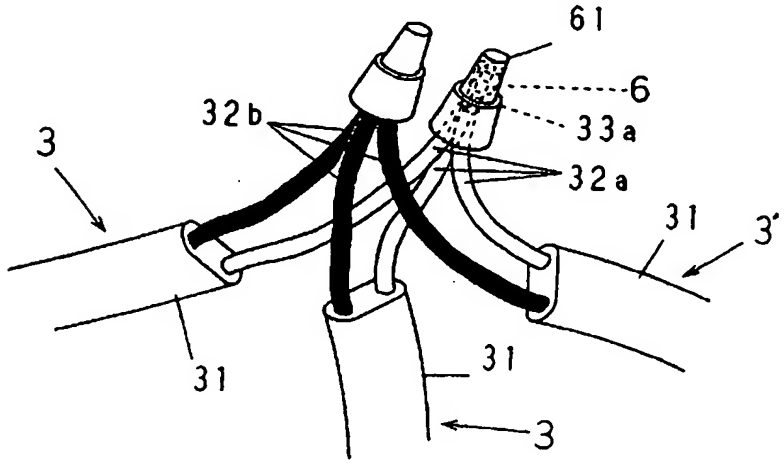

FIG. 21